

Analysis Report

Report No.: HK22120988

The Equipment Under Test (EUT) (NC4533) is a composite device which consists of 2.4GHz wireless and Bluetooth 3.0 functions.

The 2.4GHz wireless portion is using two antennas with frequency range between 2402MHz and 2479MHz

The Bluetooth portion is using one antenna with frequency range between 2402MHz and 2480MHz

Bluetooth portion

Antenna Type: Internal, Integral

Antenna Gain: 1.98 dBi

Conducted peak power range: -10 dBm to +10 dBm

Conducted average power range: -15 dBm to 2 dBm

2.4GHz portion

Antenna Type: Internal, Integral

Antenna Gain: 3.03 dBi (Ant 1)

Antenna Gain: 2.64 dBi (Ant 2)

Conducted peak power range: -10 dBm to +10 dBm

Conducted average power range: -15 dBm to 2 dBm

According to the KDB447498 D01 v06:

For Bluetooth, 2.4GHz portion (Ant 1 and Ant 2),

Conducted Average Power (maximum)

= 2 dBm (1.58 mW)

The SAR Exclusion Threshold Level:

= $3.0 * (\text{min. test separation distance, mm}) / \text{sqrt}(\text{freq. in GHz})$

= $3.0 * 5 / \text{sqrt}(2.480)$ mW

= 9.53 mW

Since the above conducted output power is well below the SAR Exclusion threshold level, so the EUT is considered to comply with SAR requirement without testing.

Simultaneous Transmission SAR exclusion considerations

Since the both antenna of this device may operate simultaneously, simultaneous transmission analysis is required. Per KDB 447498, simultaneous transmission SAR test exclusion can be applied when the sum of 1-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit ($\leq 1.6\text{W/kg}$). When the standalone SAR test exclusion is applied, the standalone 1-g SAR must be estimated according to the following equation,

$$\text{Estimated SAR} = (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD)$$

where

$F(\text{GHz})$ is the RF channel transmit frequency in GHz

P_{max} is the max. power of channel, including tune-up tolerance, mW

TD is the min. test separation distance, mm

For Bluetooth,

Maximum Time-averaged Conducted Power of this device = 1.58 mW

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned} \text{Estimated SAR} &= (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.066 \text{ W/kg}} \end{aligned}$$

where $P_{\text{max}} = 1.58 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.480 \text{ GHz}$

For 2.4GHz portion (Antenna 1 and Antenna 2),

Maximum Time-averaged Conducted Power of this device = 1.58 mW

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned} \text{Estimated SAR} &= (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.066 \text{ W/kg}} \end{aligned}$$

where $P_{\text{max}} = 1.58 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.479 \text{ GHz}$

Simultaneous Transmission Analysis

Bluetooth SAR (W/kg)	2.4GHz Antenna 1 SAR (W/kg)	2.4GHz Antenna 2 SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.066	0.066	0.066	0.2	No

Conclusion

Since the above summed SAR result for all simultaneous transmission conditions were below the SAR limit (1.6 W/kg), SAR evaluation for simultaneous transmission configuration are not required.